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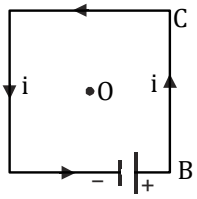
Exercise - I (Conceptual Questions) Build Up Your Understanding

MAGNETIC FIELD & BIOT-SAVART LAW

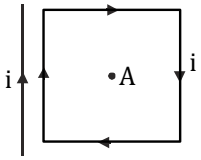
1. A stationary magnet does not interact with :-
(1) iron rod (2) moving charge
(3) moving magnet (4) stationary charge

2. Figure shows a square shape loop, whose one arm BC produces magnetic field B at the centre of coil. The resultant magnetic field due to all the arms will be :-



(1) 4B (2) B/2 (3) B (4) 2B

3. A wire is parallel to one arm of a square current carrying loop, which also carries current. Now at any point A within the coil the magnetic field will be :-



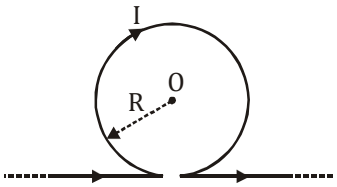
(1) less than the magnetic field produced due to loop only.
(2) more than the magnetic field produced due to loop only.
(3) equal to the earlier.
(4) zero

4. A current of 10 A is established in a long wire along positive z -direction. The magnetic field B at the point (1m, 0, 0) is :-
(1) 1 μT along the –y direction
(2) 2μT along the +y direction
(3) 1μT along the –x direction
(4) 2μT along the +x direction

5. Radius of current carrying coil is 'R'. Then ratio of magnetic fields at the centre of the coil to the axial point, which is $R\sqrt{3}$ distance away from the centre of the coil :-
(1) 1 : 1 (2) 1 : 2 (3) 1 : 4 (4) 8 : 1

6. A coil of one loop is made by a wire of length L and there after a coil of two loops is made by same wire. The ratio of magnetic field at the centre of coils respectively :-
(1) 1 : 4 (2) 1 : 1 (3) 1 : 8 (4) 4 : 1

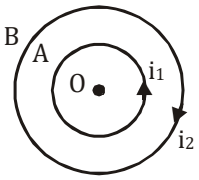
7. Magnetic field at point O will be :-



(1) $\frac{\mu_0 I}{2R}\otimes$ (2) $\frac{\mu_0 I}{2R}\odot$
(3) $\frac{\mu_0 I}{2R}\left(1-\frac{1}{\pi}\right)\otimes$ (4) $\frac{\mu_0 I}{2R}\left(1+\frac{1}{\pi}\right)\odot$

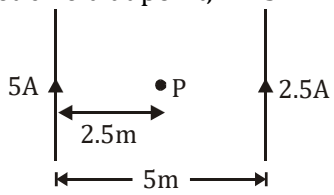
8. The vector form of Biot savart law for a current carrying element is :-
(1) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{id\ell\sin\phi}{r^2}$ (2) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\hat{r}}{r^2}$
(3) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\hat{r}}{r^3}$ (4) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\vec{r}}{r^2}$

9. A and B are two concentric circular loop carrying current i_1 and i_2 as shown in figure. If ratio of their radii is 1:2 and ratio of the flux densities at the centre O due to A and B is 1:3 then the value of $\frac{i_1}{i_2}$ will be :-



(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{6}$

10. For the given current distribution the magnetic field at point, 'P' is :-



(1) $\frac{\mu_0}{4\pi}\odot$ (2) $\frac{\mu_0}{\pi}\otimes$ (3) $\frac{\mu_0}{2\pi}\otimes$ (4) $\frac{\mu_0}{2\pi}\odot$

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11. 1A current flows through an infinitely long straight wire. The magnetic field produced at a point 1m. away from it is :–

(1) 2×10^{-3} T (2) $\frac{2}{10}$ T

(3) 2×10^{-7} T (4) $2\pi \times 10^{-6}$ T

12. Two infinite long parallel wires carry equal currents in same direction. The magnetic field at mid point between the two wires is :–

(1) Twice the magnetic field produced due to each of the wires

(2) Half of the magnetic field produced due to each of the wires

(3) Square of the magnetic field produced due to each of the wires

(4) Zero

13. A closely wound flat circular coil of 25 turns of wire has diameter of 10 cm and carries a current of 4 ampere. Determine the magnetic flux density at the centre of the coil :-

(1) 1.679×10^{-5} T (2) 2.028×10^{-4} T

(3) 1.257×10^{-3} T (4) 1.512×10^{-6} T

14. π ampere current is flowing through a long straight wire. Due to this a field of 5×10^{-5} T produced, then distance of the point from the axis of the wire is :-

(1) $10^4\mu_0$ m (2) $10^5\mu_0$ m

(3) $10^6\mu_0$ m (4) $10^8\mu_0$ m

15. Radius of a current carrying coil is 'R'. The ratio of magnetic field at a axial point which is R distance away from the centre of the coil to the magnetic field at the centre of the coil :-

(1) $\left(\frac{1}{2}\right)^{1/2}$ (2) $\frac{1}{2}$

(3) $\left(\frac{1}{2}\right)^{3/2}$ (4) $\frac{1}{4}$

16. When the current flowing in a circular coil is doubled and the number of turns of the coil in it is halved, the magnetic field at its centre will become :-

(1) Same (2) Four times

(3) Half (4) Double

17. Which of the following statement is not true; magnetic field at the centre of current carrying loop :-

(1) proportional to current

(2) inversely proportional to radius

(3) proportional to number of turns

(4) none

18. A circular coil of radius R carries an electric current. The magnetic field due the coil at a point on the axis of the coil located at a distance r from the center of the coil, such that r >> R varies as :-

(1) $1/r$ (2) $1/r^{3/2}$

(3) $1/r^2$ (4) $1/r^3$

19. Two concentric circular loops of radii 0.08m and 0.1m carries current such that magnetic field at the centre is zero. If the current in the outer loop is 8A clockwise, current in the inner loop is :-

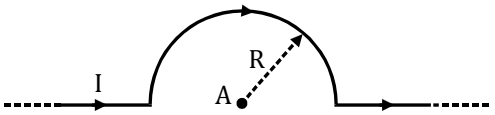
(1) 6.4 A anticlockwise

(2) 6.4 A clockwise

(3) 8A anticlockwise

(4) 3.2 A clockwise

20. In the shown figure magnetic field at point A will be :-



(1) $\frac{\mu_0 I}{4\pi}$ (2) $\frac{\mu_0 I}{4R}$ (3) $\frac{\mu_0 I}{4\pi R}$ (4) Zero

21. If radius of coil becomes two times and current becomes half then magnetic field at centre of the coil will be :-

(1) Two times (2) Four times

(3) Half (4) One fourth

22. 2A current is flowing in a circular loop of radius 1m. Magnitude of magnetic field at the centre of circular loop will be :-

(1) $\frac{\mu_0}{2}$ (2) $2\mu_0$

(3) μ_0 (4) $\frac{\mu_0}{2\pi}$

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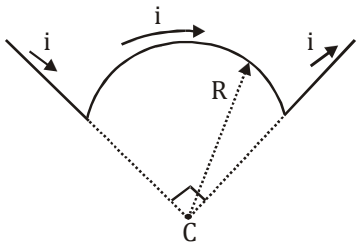
23. A horizontal overhead powerline is at a height of 4m from the ground and carries a current of 100 A from east to west. The magnetic field directly below it on the ground is :-
(1) 2.5 10^{-7} T, southward
(2) 5×10^{-6} T, northward
(3) 5×10^{-6} T, southward
(4) 2.5×10^{-7} T, northward

24. The wire in the figure carries a current i and consists of a circular arc of radius R and central angle $\frac{\pi}{2}$ rad, and two straight sections whose extensions intersect the centre C of the arc. The magnetic field $\vec{B}$ that the current produces at C is :-



(1) $|\vec{B}| = \frac{\mu_0 i}{8R}$ into the plane of the figure
(2) $|\vec{B}| = \frac{\mu_0 i}{8R}$ out of the plane of the figure
(3) $|\vec{B}| = \frac{\mu_0 i}{8\pi R}$ into the plane of the figure
(4) $|\vec{B}| = \frac{\mu_0 i}{8\pi R}$ out of the plane of the figure

AMPERE'S LAW

25. For the hollow thin cylindrical current carrying pipe which statement is correct :-
(1) magnetic field inside the pipe is not zero
(2) magnetic field outside the pipe is zero
(3) electric field outside the pipe is zero
(4) electric field on the surface of pipe is zero

26. In a current carrying long solenoid the field produced does not depend on :-
(1) number of turns per unit length
(2) current in solenoid
(3) radius of cross section of the solenoid
(4) all of the above

27. If length and number of turns becomes half for a solenoid then value of magnetic field becomes:-
(1) twice (2) same
(3) half (4) one fourth

28. If number of turns and current become double for any solenoid, then value of magnetic field becomes:-
(1) twice (2) same
(3) half (4) four times

29. A current of $1/4\pi$ ampere is flowing through a toroid. It has 1000 number of turn per meter then value of magnetic field (in Wb/m^2) along its axis is :-
(1) 10^{-2} (2) 10^{-3}
(3) 10^{-4} (4) 10^{-7}

30. Mean radius of a toroid is 10 cm and number of turns are 500. If current flowing through it is 0.1 ampere then value of magnetic field (in tesla) for toroid :-
(1) 10^{-2} (2) 10^{-5} (3) 10^{-3} (4) 10^{-4}

31. A long solenoid has length L, average diameter D and n layer of turns. Each layer contains N turns. If current flowing through the solenoid is i the value of magnetic field at the centre :-
(1) Proportional to D
(2) Inversely proportional to D
(3) Does not depend on D
(4) Proportional to L

32. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of the magnetic field is :-
(1) B/2 (2) B (3) 2B (4) 4B

33. A long solenoid having 200 turns/cm and carries current i. Magnetic field at its axis is $6{\cdot}28 \times 10^{-2}$ wb/m^2. An another solenoid having 100 turns/cm and carries $\frac{i}{3}$ current, then magnetic field at its axis will be :-
(1) 1.05×10^{-4} Wb/m^2
(2) 1.05×10^{-2} Wb/m^2
(3) 1.05×10^{-5} Wb/m^2
(4) 1.05×10^{-3} Wb/m^2

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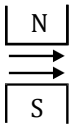
MAGNETIC FORCE & MOVING CHARGE IN MAGNETIC FIELD

34. A proton and an alpha particle are separately projected in a region where a uniform magnetic field exists. The initial velocities are perpendicular to the direction of magnetic field. If both the particles move along circles of equal radii, the ratio of momentum of proton to alpha particle $\left(\frac{P_p}{P_\alpha}\right)$ is :-

(1) 1 (2) 1/2
(3) 2 (4) 1/4

35. Cathode rays are moving between the poles of a magnet. Due to the effect of magnetic field of magnet :-



(1) velocity of rays increases
(2) velocity of rays decreases
(3) rays deflected towards south pole
(4) rays deflected in upward direction and perpendicular to the plane of the paper

36. Following charge has maximum frequency of rotation in uniform transverse magnetic field :-

(1) a proton (2) an alpha particle
(3) an electron (4) a neutron

37. Which of the following particle will experiences maximum magnetic force, when projected with the same velocity perpendicular to a magnetic field :-

(1) electron (2) proton
(3) He^+ (4) Li^{++}

38. When α and β rays are subjected to a magnetic field which is perpendicular to the direction of their motion, with their same speed. The curvature of path of both the particles are :-

(1) equal
(2) more for α particles
(3) more for β particles
(4) none

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39. Two identically charged particles A and B initially at rest, are accelerated by a common potential difference V. They enters into a uniform transverse magnetic field B and describe a circular path of radii r_1 and r_2 respectively then their mass ratio is :-

(1) $\left(\frac{r_1}{r_2}\right)^2$ (2) $\left(\frac{r_2}{r_1}\right)^2$
(3) $\left(\frac{r_1}{r_2}\right)$ (4) $\left(\frac{r_2}{r_1}\right)$

40. An α-particle experiences a force of 3.84×10^{-14} N when it moves perpendicular to magnetic field of 0.2 Wb/m^2 then speed of the α - particle is :-

(1) 6.0×10^5 m/sec (2) 5.0×10^5 m/sec
(3) 1.2×10^6 m/sec (4) 3.8×10^6 m/sec

41. If an electron enters a magnetic field with its velocity pointing in the same direction as the magnetic field then :–

(1) the electron will turn towards right
(2) the electron will turn towards left
(3) the velocity of the electron will increase
(4) the velocity of the electron will remain unchanged

42. A charge having q/m equal to 10^8 C/kg and with velocity 3×10^5 m/s enters into a uniform magnetic field B = 0.3T at an angle 30° with direction of field. Then radius will be :-

(1) 0.01 cm (2) 0.5 cm
(3) 1 cm (4) 2 cm

43. When a charged particle enters in a uniform magnetic field its kinetic energy :-

(1) remains constant (2) increases
(3) decreases (4) becomes zero

44. Two particles x and y have equal charges and possessing equal kinetic energy enter in a uniform magnetic field and describe circular path of radius of curvature r_1 and r_2 respectively. The ratio of their masses is :-

(1) $\left(\frac{r_1}{r_2}\right)$ (2) $\left(\frac{r_1}{r_2}\right)^{1/2}$ (3) $\left(\frac{r_1}{r_2}\right)^2$ (4) $\left(\frac{r_2}{r_1}\right)$

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45. An electron having mass 'm' and kinetic energy E enter in uniform magnetic field B perpendicularly, then its frequency of uniform circular motion will be :-

(1) $\frac{eE}{qVB}$ (2) $\frac{2\pi m}{eB}$

(3) $\frac{eB}{2\pi m}$ (4) $\frac{2m}{eBE}$

46. In a mass spectrograph an ion A of mass number 24 and charge +e and an ion B of mass number 22 and charge +2e are entered in transverse magnetic field with same velocity. The ratio of radii of their paths respectively :-

(1) $\frac{11}{24}$ (2) $\frac{12}{11}$

(3) $\frac{11}{22}$ (4) $\frac{24}{11}$

47. A charge particle is moving in the direction of a magnetic field. The magnetic force acting on the particle :-

(1) is in the direction of its velocity

(2) is in the direction opposite to its velocity

(3) is perpendicular to its velocity

(4) is zero

48. An electron of kinetic energy of 7.2×10^{-18} J is revolving in a circular path in magnetic field 9×10^{-5} Wb/m^2 then radius of its circular path is:–

(1) 1.25 cm. (2) 2.5 m.

(3) 2.5 cm. (4) 25.0 cm.

49. An electron moves with velocity v in uniform transverse magnetic field B on circular path of radius 'r', then e/m for it is :-

(1) $\frac{v}{Br}$ (2) $\frac{B}{rv}$

(3) Bvr (4) $\frac{vr}{B}$

50. A proton, deutron and an α–particle are accelerated by same potential, enter in uniform magnetic field perpendicularly. Ratio of radii of circular path respectively :-

(1) $1 : \sqrt{2} : \sqrt{2}$ (2) 2 : 2 : 1

(3) 1 : 2 : 1 (4) 1 : 1 : 1

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51. A charged particle moves through a magnetic field in a direction perpendicular to it. Then the :-

(1) speed of the particle remains unchanged

(2) direction of motion of particle remains unchanged

(3) acceleration of particle remains unchanged

(4) velocity of particle remains unchanged

52. A magnetic field :-

(1) Always exerts a force on charged particle

(2) Never exerts a force on charged particle

(3) Exert a force, if the charged particle is moving across the magnetic field line

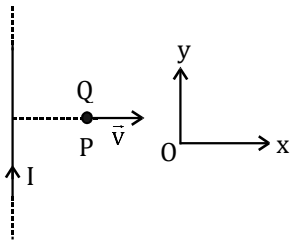
(4) Exerts a force, if the charged particle is moving along the magnetic field line

53. A proton and an α-particle moving with the same velocity and enter into a uniform magnetic field which is acting normal to the plane of their motion. The ratio of the radii of the circular paths described by the proton and α-particle respectively :-

(1) 1 : 2 (2) 1 : 4

(3) 1 : 16 (4) 4 : 1

54. A very long straight wire carries a current I. At the instant when a charge +Q at point P has velocity $\vec{v}$, as shown, the magnetic force on the charge is:-



(1) along ox (2) opposite to oy

(3) along oy (4) opposite to ox

LORENTZ FORCE & MOTION OF CHARGED PARTICALS IN B

55. In Thomson mass spectrograph $\vec{E} \perp \vec{B}$ then the velocity of undeflected electron beam will be :–

(1) $\frac{|\vec{E}|}{|\vec{B}|}$ (2) $\vec{E} \times \vec{B}$

(3) $\frac{|\vec{B}|}{|\vec{E}|}$ (4) $\frac{E^2}{B^2}$

56. Cyclotron is used to accelerate :-
(1) electrons (2) neutrons
(3) positive ions (4) negative ions

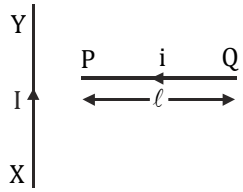
57. A charge 'q' moves in a region where electric field and magnetic field both exist, then force on it :-
(1) $q(\vec{v}\times\vec{B})$ (2) $q\vec{E}+q(\vec{v}\times\vec{B})$
(3) $q\vec{E}+q(\vec{B}\times\vec{v})$ (4) $q\vec{B}+q(\vec{E}\times\vec{v})$

58. An electric field E and a magnetic field B applied on a proton which moves with velocity v, it goes undeflected through the region if :-
(1) $E \perp B$
(2) E is parallel to v and perpendicular to B
(3) E, B and v all three mutually perpendicular to each other and v = E/B
(4) E and B both are parallel but perpendicular to v

59. In a region constant uniform electric and magnetic field is present. Both field are parallel. In this region a charge released from rest, then path of particle is :-
(1) Circle (2) Helical
(3) Straight line (4) Ellipse

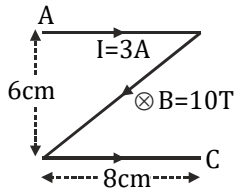
FORCE ON A CURRENT-CARRYING CONDUCTOR

60. A wire PQ carries a current 'i' is placed perpendicular to a long wire XY carrying a current I. The direction of force on PQ will be:-



(1) towards right (2) towards left
(3) upwards (4) downwards

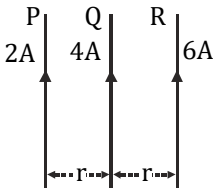
61. A current carrying wire AC is placed in uniform transverse magnetic field then the force on wire AC :-



(1) 3N (2) 4.2N (3) 6N (4) 4N

62. Force exist on a current carrying wire which is placed in external magnetic field, due to :–
(1) free electrons in wire
(2) free positive ions in wire
(3) (1) & (2) both
(4) none

63. P, Q and R long parallel straight wires in air, carrying currents as shown. The direction of resultant force on R is :-



(1) towards left
(2) towards right
(3) the same as that of current in Q
(4) perpendicular to plane of paper

64. Two parallel wires in free space are 10 cm apart and each carries a current of 10 A in the same direction. The magnetic force per unit length of each wire is :-
(1) 2×10^{-4} N, attractive
(2) 2×10^{-4} N, repulsive
(3) 2×10^{-7} N, attractive
(4) 2×10^{-7} N, repulsive

65. Wire in the form of a right angle ABC, with AB=3cm and BC = 4cm, carries a current of 10A. There is a uniform magnetic field of 5T perpendicular to the plane of the wire. The force on the wire will be :-
(1) 1.5N (2) 2.0N
(3) 2.5N (4) 3.5N

66. When direct current passed through a spring then it :-
(1) Contracts (2) Expands
(3) Vibrate (4) Unchange

67. A rectangular loop carrying a current i_1, is situated near a long straight wire carrying a steady current i_2. The wire is parallel to one of the sides of the loop and is in the plane of the loop as shown in the figure. Then the current loop will :–

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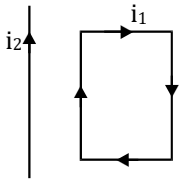

(1) move away from the wire
(2) move towards the wire.
(3) remain stationary.
(4) rotate about an axis parallel to the wire.

68. A current carrying wire is arranged at any angle in an uniform magnetic field, then
(1) only force acts on wire
(2) only torque acts on wire
(3) both
(4) none

69. Two parallel beams of positrons moving in the same direction will :-
(1) Repel to each other
(2) Will not interact with each other
(3) Attract to each other
(4) Be deflected normal to the plane containing the two beams

CURRENT LOOP & MOVING COIL GALVANOMETER

70. Due to the flow of current in a circular loop of radius R, the magnetic field produced at the centre of the loop is B. The magnetic moment of the loop is :-
(1) $BR^3/2\ \pi\mu_0$ (2) $2\pi\ BR^3/\mu_0$
(3) $BR^2/2\pi\mu_0$ (4) $2\pi\ BR^2/\mu_0$

71. A circular loop has a radius of 5 cm. and it is carrying a current of 0.1 A. its magnetic moment is :–
(1) 1.32×10^{-4} amp-m^2
(2) 2.62×10^{-4} amp-m^2
(3) 5.25×10^{-4} amp-m^2
(4) 7.85×10^{-4} amp-m^2

72. An electron is moving in a circle of radius 5.1×10^{-11} m at a frequency of 6.8×10^{15} rev./sec. The equivalent current is approximately :–
(1) 5.1×10^{-3} A (2) 6.8×10^{-3} A
(3) 1.1×10^{-3} A (4) 2.2×10^{-3} A

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73. If number of turn, area and current through the coil is given by n, A and i respectively then its magnetic moment will be :–
(1) niA (2) n^2iA (3) niA^2 (4) $\frac{ni}{\sqrt{A}}$

74. An electron is moving around a proton in an orbit of radius 1Å and produces 16 Wb/m^2 of magnetic field at the centre, then find the angular velocity of electron :-
(1) $20\ \pi \times 10^{16}$ rad/sec
(2) 10×10^{16} rad/sec
(3) $\frac{5}{2\pi} \times 10^{16}$ rad/sec
(4) $\frac{5}{4\pi} \times 10^{16}$ rad/sec

75. Current I is flowing in a conducting circular loop of radius R. It is kept in a magnetic field B which is perpendicular to the plane of circular loop, the magnetic force acting on the loop is :-
(1) IRB (2) 2πIRB
(3) Zero (4) πIRB

76. The unit of magnetic moment will be :-
(1) $\frac{A}{m}$ (2) A-m^2
(3) $\frac{T-m}{A}$ (4) $\frac{T-m}{A^2}$

77. A current carrying coil behave like tiny magnet. If area of coil is A and magnetic moment is 'M' then current through the coil is :-
(1) $\frac{M}{A}$ (2) $\frac{A}{M}$ (3) MA (4) $\frac{A^2}{M}$

78. An electron revolves with frequency 6.6×10^{15} r.p.s. around nucleus in circular orbit of radius 0.53 Å of hydrogen atom, then magnetic field produced at centre of orbit is :-
(1) 0.125 T (2) 1.25 T
(3) 12.5 T (4) 125 T

79. A current loop of area 0.01m^2 and carrying a current of 10A is held perpendicular to a magnetic field of 0.1T, the torque in N–m acting on the loop is :-
(1) 0 (2) 0.001 (3) 0.01 (4) 1.1

80. The magnetic moment (μ) of a revolving electron around the nucleus varies with principal quantum number n as :-
(1) $\mu \propto n$ (2) $\mu \propto 1/n$
(3) $\mu \propto n^2$ (4) $\mu \propto 1/n^2$

81. A current carrying coil is placed in a constant uniform magnetic field B. Torque is maximum on this coil when plane of coil is :-
(1) perpendicular to B (2) parallel to B
(3) at 45° to B (4) at 60° to B

82. Magnetic field is parallel to the plane of coil then torque will be :-
(1) Maximum (2) Minimum
(3) Zero (4) None of these

BAR MAGNET

83. The work done in rotating a magnet of magnetic moment M by an angle of 90° from the external magnetic field direction is 'n' times the corresponding work done to turn it through an angle of 60°. Where 'n' gives by :-
(1) 1/2 (2) 2 (3) 1/4 (4) 1

84. Magnetic field lines produced by a bar magnet, cuts each other :–
(1) At neutral points
(2) Near the poles of the magnets
(3) At equatorial axis
(4) Never intersects to each other

EARTH MAGNETIC FIELD

85. If the angle of dip at two places are 30° and 45° respectively, then the ratio of horizontal component of earth's magnetic field at two places assuming magnitude of total magnetic field of earth is same, will be :-
(1) $\sqrt{3}:\sqrt{2}$ (2) $1:\sqrt{2}$ (3) $1:\sqrt{3}$ (4) 1 : 2

86. Two bar magnets having same geometry with magnetic moments M and 2M, are firstly placed in such a way that their similar poles are same side then its time period of oscillation is T_1. Now the polarity of one of the magnet is reversed then time period of oscillation is T_2, then :-
(1) $T_1 < T_2$ (2) $T_1 = T_2$
(3) $T_1 > T_2$ (4) $T_2 = \infty$

87. Magnetic field of earth is 0.3 gauss. A magnet oscillating with rate of 5 oscillation/min. How much the magnetic field of earth is increased, so the number of oscillations become 10 per min :-
(1) 0.3G (2) 0.6G
(3) 0.9G (4) 1.2G

88. A magnet makes 40 oscillations per minute at a place having magnetic field of 0.1×10^{-5} T. At another place, it takes 2.5 sec to complete one vibration. The value of earth's horizontal field at that place is :-
(1) 0.25×10^{-6} T (2) 0.36×10^{-6} T
(3) 0.66×10^{-8} T (4) 1.2×10^{-6} T

89. The magnetic needle of a tangent galvanometer is deflected at an angle 30°. The horizontal component of earth's magnetic field 0.34×10^{-4} T is along the plane of the coil. The magnetic field of coil :-
(1) 1.96×10^{-4} T (2) 1.96×10^{-5} T
(3) 1.96×10^{4} T (4) 1.96×10^{5} T

MAGNETIC PROPERTIES OF MATERIALS

90. For protecting a magnetic needle it should be placed :-
(1) in an iron box (2) in wooden box
(3) in metallic box (4) none of these

91. Which of the following materials is repelled by an external magnetic field :-
(1) Iron (2) Cobalt
(3) Steel (4) Copper

92. If a diamagnetic material is placed in a magnetic field, the flux density inside the material compared to that outside will be :
(1) Slightly less (2) Slightly more
(3) Very much more (4) Same

93. To protect a sensitive instrument from external magnetic jerks, it should be placed in a container made of :-
(1) Nonmagnetic substance
(2) Diamagnetic substance
(3) Paramagnetic substance
(4) Ferromagnetic substance

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94. Substances in which the magnetic moment of a single atom is not zero, are known as :-
(1) Diamagnetic (2) Ferromagnetic
(3) Paramagnetic (4) (2) and (3) both

95. Susceptibility of a magnetic substance is found to depend on temperature and the strength of the magnetising field. The material is a :-
(1) Diamagnetic (2) Ferromagnetic
(3) Paramagnetic (4) Superconductor

96. Property possessed by only ferromagnetic substance is :-
(1) Attracting magnetic substance
(2) Hysteresis
(3) Susceptibility independent of temperature
(4) Directional property

97. The hard ferromagnetic material is characterized by :-
(1) Narrow hysteresis loop
(2) Broad hysteresis loop
(3) High mechanically hardness, all over
(4) Mechanically hard surface

98. The magnetic moment of paramagnetic materials is :-
(1) Infinity (2) Zero
(3) Constant but low (4) None of above

99. The cause of paramagnetism is :-
(1) Unparied electrons
(2) Electron excess and spin motion of electrons
(3) Paired electrons and orbital motion of electrons
(4) Electrons and orbital motion of electrons

100. The cause of diamagnetism is :-
(1) Orbital motion of electrons
(2) Spin motion of electrons
(3) Paired electrons
(4) None of the above

101. The magnetic moment of diamagnetic materials is :-
(1) Infinity
(2) Zero
(3) 100 amp–m^2
(4) None of the above

102. Which of the following statements is correct for diamagnetic materials :-
(1) $\mu_r < 1$
(2) χ is negative and low
(3) χ does not depend on temperature
(4) All of the above

103. The area of B–H loop for soft iron, as compared to that for steel is :-
(1) More
(2) Less
(3) Equal
(4) None of the above

104. The liquid in the watch glass in the following figure is -

(1) Ferromagnetic (2) Paramagnetic
(3) Diamagnetic (4) Nonmagnetic

105. Powerful permanent magnets are made of :-
(1) Cobalt (2) Aluminum
(3) Tin–coal (4) Cobalt–steel

106. Which of the following statements is correct for ferromagnetic material :-
(1) These become diamagnetic at Curie temperature
(2) These become paramagnetic at Curie temperature
(3) Their magnetic susceptibility becomes zero at Curie temperature
(4) Its magnetic properties are explained on the basis of electron principle

107. A material rod, when placed in a strong magnetic field, aligns itself at right angles to the magnetic field. The nature of material is :-
(1) Diamagnetic
(2) Paramagnetic
(3) Ferromagnetic
(4) Low ferromagnetic

108. The relative permeability of air is :-
(1) Zero (2) 1.04
(3) Infinity (4) 1

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109. If the magnetic susceptibility of a magnetic material is –0.004 then its nature will be :-
(1) Diamagnetic (2) Paramagnetic
(3) Ferromagnetic (4) Non magnetic

110. The correct measure of magnetic hardness of a material is :-
(1) Remanent magnetism
(2) Hysteresis loss
(3) Coercivity
(4) Curie temperature

111. If the relative permeability of a material is 0.9999 then its nature will be :-
(1) Paramagnetic (2) Diamagnetic
(3) Ferromagnetic (4) Non–magnetic

112. The magnetic susceptibility of a paramagnetic material at –73°C is 0.0075 then its value at –173°C will be :-
(1) 0.0045 (2) 0.0030
(3) 0.015 (4) 0.0075

113. When a magnetic substance is heated, then it :
(1) Becomes a strong magnet
(2) Losses its magnetism
(3) Does not effect the magnetism
(4) Either (1) or (3)

114. Diamagnetic substance are :-
(1) Feebly attracted by magnets
(2) Strongly attracted by magnets
(3) Feebly repelled by magnets
(4) Strongly repelled by magnets

115. If a diamagnetic solution is poured into a U-tube and one arm of this U-tube placed between the poles of a strong magnet with the meniscus in a line with the field, then the level of the solution will :-
(1) Rise (2) Fall
(3) Oscillate slowly (4) Remain as such

116. Magnetic permeability is maximum for :
(1) Diamagnetic substance
(2) Paramagnetic substance
(3) Ferromagnetic substance
(4) All of these

117. Which one of the following is ferro-magnetic :-
(1) Co (2) Zn
(3) Hg (4) Pt

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118. For paramagnetic materials magnetic susceptibility is related with temperature as :-
(1) $\propto T^2$ (2) $\propto T^1$
(3) $\propto T^{-1}$ (4) $\propto T^{-2}$

119. According to Curie's law, the magnetic susceptibility of a substance at an absolute temperature T is proportional to :-
(1) 1/T (2) T
(3) $1/T^2$ (4) T^2

120. A diamagnetic material in a magnetic field moves
(1) from stronger to the weaker parts of the field
(2) from weaker to the stronger parts of the field
(3) perpendicular to the field
(4) in none of the above directions

121. Diamagnetic substances characterise by :-
(1) low and negative magnetic susceptibility
(2) low and positive magnetic susceptibility
(3) high and negative magnetic susceptibility
(4) high and positive magnetic susceptibility

122. Magnetic susceptibility of a diamagnetic substance varies with absolute temperature as :-
(1) directly proportional to T
(2) inversely proportional to T
(3) remains unchanged with T
(4) exponential decrease with T

123. The material of permanent magnet has
(1) High retentivity, low coercivity
(2) Low retentivity, high coercivity
(3) Low retentivity, low coercivity
(4) High retentivity, high coercivity

124. Hysteresis property is shown by :-
(1) paramagnetic and diamagnetic
(2) diamagnetic
(3) paramagnetic
(4) ferromagnetic

125. Magnetic susceptibility of the following is :
(1) negative for diamagnetic
(2) positive for diamagnetic and paramagnetic
(3) negative for diamagnetic and zero for paramagnetic
(4) zero for paramagnetic and positive for ferromagnetic

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126. Which statement is true :
(1) atomic magnetic dipole moment of diamagnet is zero
(2) atomic magnetic dipole moment of para-magnet is zero
(3) atomic magnetic dipole moment of ferro-magnet is zero
(4) ferromagnet is demagnetised rapidly after moving in magnetising field.

127. Curie-Weiss law is obeyed by iron at a temperature.....
(1) Below Curie temperature
(2) Above Curie temperature
(3) At Curie temperature only
(4) At all temperatures

128. Ferromagnetic substance contain :-
(1) empty subshell
(2) partially empty subshell
(3) full fill subshell
(4) none of these

129. Soft iron is used to make the core of transformer, because of its :
(1) low coercivity and low retentivity
(2) low coercivity and high retentivity
(3) high coercivity and high retentivity
(4) high coercivity and low retentivity

130. Above curie temperature ferromagnetic substance converts into :
(1) paramagnetic (2) diamagnetic
(3) ferromagnetic (4) non magnetic

131. Relation between μ_r and χ will be :
(1) $\mu_r = 1 + \chi$ (2) $\chi = \mu_r + 1$
(3) $\frac{\mu_0}{\mu}$ (4) $\mu_0\chi$

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	4	1	2	2	4	1	3	2	4	3	3	4	3	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	1	4	4	1	2	4	3	3	1	3	3	2	4	3	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	2	2	2	4	3	4	3	1	1	4	2	1	3	3
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	4	4	4	1	1	1	3	1	3	1	3	2	3	3	4
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	1	1	1	1	3	1	2	1	1	2	4	3	1	2	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	2	1	3	1	1	2	1	2	4	1	1	3	2	2	1
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	4	1	4	4	2	2	2	2	2	1	2	4	2	2	4
Question	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	2	1	2	1	3	2	3	2	3	2	3	1	3	1	1
Question	121	122	123	124	125	126	127	128	129	130	131				
Answer	1	3	4	4	1	1	2	2	1	1	1				

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Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. When a charged particle moving with velocity $\vec{v}$ is subjected to a magnetic field of induction $\vec{B}$, the force on it is non-zero. This implies the
(1) angle between $\vec{v}$ and $\vec{B}$ is necessary 90°
(2) angle between $\vec{v}$ and $\vec{B}$ can have at value other than 90°
(3) angle between $\vec{v}$ and $\vec{B}$ can have at value other than zero and 180°
(4) angle between $\vec{v}$ and $\vec{B}$ is either zero or 180°

AIPMT 2007

2. Under the influence of a uniform magnetic field a charged particle is moving in a circle of radius R with constant speed v. The time period of the motion :-
(1) depends on R and not on v
(2) depends on v and not on R
(3) depends on both R and v
(4) is independent of both R and v

3. A charged particle (q) is moving in a circle of radius R with uniform speed v. The associated magnetic moment μ is given by :-
(1) qvR (2) qvR/2
(3) qvR^2 (4) $qvR^2/2$

4. A beam of electrons passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained, the electrons move :-
(1) along a straight line
(2) in an elliptical orbit
(3) in a circular orbit
(4) along a parabolic path

5. In a mass spectrometer used for measuring the masses of ions, the ions are initially accelerated by an electric potential V and then made to describe semi-circular paths of radius R using a magnetic field B.
If V and B are kept constant, the ratio $\left(\frac{\text{Charge on the ion}}{\text{mass of the ion}}\right)$ will be proportional to:
(1) R (2) $\frac{1}{R}$ (3) $\frac{1}{R^2}$ (4) R^2

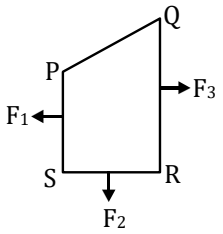
TG: @Chalnaayaaar

6. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond Curie temperature then it will show :-
(1) diamagnetism
(2) paramagnetism
(3) anti ferromagnetism
(4) no magnetic property

AIPMT 2008

7. A particle of mass m, charge Q and kinetic energy T enters a transverse uniform magnetic field of induction $\vec{B}$. After 3 seconds the kinetic energy of the particle will be:-
(1) T (2) 4 T (3) 3T (4) 2T

8. A closed loop PQRS carrying a current is placed in a uniform magnetic field. If the magnetic forces on segments PS, SR and RQ are F_1, F_2 and F_3 respectively and are in the plane of the paper and along the directions shown, the force on the segment QP is :-



(1) $\sqrt{(F_3-F_1)^2-F_2^2}$ (2) $F_3 - F_1 - F_2$
(3) $F_3 - F_1 + F_2$ (4) $\sqrt{(F_3-F_1)^2+F_2^2}$

AIPMT 2009

9. The magnetic force acting on a charged particle of charge −2μC in a magnetic field of 2T acting in y direction, when the particle velocity is $(2\hat{i}+3\hat{j}) \times 10^6\ ms^{-1}$ is :-
(1) 8N in z-direction (2) 8N in −z direction
(3) 4N in z-direction (4) 8N in y-direction

AIPMT 2010

10. A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop. If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is :-
(1) $\vec{F}$ (2) $3\vec{F}$ (3) $-\vec{F}$ (4) $-3\vec{F}$

TG: @Chalnaayaar

11. A thin ring of radius R meter has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic induction in Wb/m^2 at the centre of the ring is :-

(1) $\frac{\mu_0 qf}{2R}$ (2) $\frac{\mu_0 qf}{2\pi R}$

(3) $\frac{\mu_0 q}{2\pi fR}$ (4) $\frac{\mu_0 q}{2fR}$

12. A current loop consists of two identical semi-circular parts each of radius R, one lying in the x-y plane and the other in x-z plane. If the current in the loop is i. The resultant magnetic field due to the two semi-circular parts at their common centre is :-

(1) $\frac{\mu_0 i}{2R}$ (2) $\frac{\mu_0 i}{4R}$

(3) $\frac{\mu_0 i}{\sqrt{2}R}$ (4) $\frac{\mu_0 i}{2\sqrt{2}R}$

13. A closely wound solenoid of 2000 turns and area of cross-section 1.5×10^{-4} m^2 carries a current of 2.0A. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} Tesla making an angle of 30° with the axis of the solenoid. The torque on the solenoid will be:-

(1) 1.5×10^{-3} Nm (2) 1.5×10^{-2} Nm

(3) 3×10^{-2} Nm (4) 3×10^{-3} Nm

14. A particle having a mass of 10^{-2} kg carries a charge of 5×10^{-8}C. The particle is given an initial horizontal velocity of 10^5 ms^{-1} in the presence of electric field $\vec{E}$ and magnetic field $\vec{B}$. To keep the particle moving in a horizontal direction, it is necessary that:-

(a) $\vec{B}$ should be perpendicular to the direction of velocity and $\vec{E}$ should be along the direction of velocity

(b) Both $\vec{B}$ and $\vec{E}$ should be along the direction of velocity

(c) Both $\vec{B}$ and $\vec{E}$ are mutually perpendicular and perpendicular to the direction of velocity

(d) $\vec{B}$ should be along the direction of velocity and $\vec{E}$ should be perpendicular to the direction velocity

Which one of the following pairs of statements is possible?

(1) (c) and (d) (2) (b) and (c)

(3) (b) and (d) (4) (a) and (c)

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AIPMT (Pre) 2010

15. Electromagnets are made of soft iron because soft iron has :-

(1) High retentivity and low coercive force

(2) Low retentivity and high coercive force

(3) High retentivity and high coercive force

(4) Low retentivity and low coercive force

16. A vibration magnetometer placed in magnetic meridian has a small bar magnet. The magnet executes oscillations with a time period of 2 sec in earth's horizontal magnetic field of 24μT. When a horizontal field of 18μT is produced opposite to the earth's field by placing a current carrying wire, the new time period of magnet will be :-

(1) 4s (2) 1s (3) 2s (4) 3s

AIPMT (Mains) 2010

17. The magnetic moment of a diamagnetic atom is:-

(1) 1

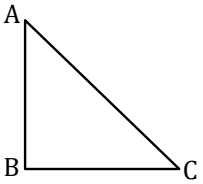
(2) Between zero and one

(3) Equal to zero

(4) Much greater than one

AIPMT (Pre) 2011

18. A current carrying closed loop in the form of a right angle isosceles triangle ABC is placed in a uniform magnetic field acting along AB. If the magnetic force on the arm BC is $\vec{F}$, the force on the arm AC is :



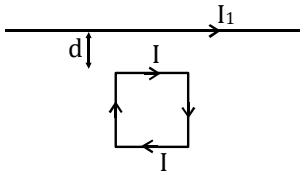
(1) $-\sqrt{2}\vec{F}$ (2) $-\vec{F}$ (3) $\vec{F}$ (4) $\sqrt{2}\vec{F}$

19. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electrons :
(1) will turn towards right of direction of motion
(2) speed will decrease
(3) speed will increase
(4) will turn towards left of direction of motion

20. There are four light-weight rod samples A,B,C D separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted :-
(i) A is feebly repelled
(ii) B is feebly attracted
(iii) C is strongly attracted
(iv) D remains unaffected
Which one of the following is true?
(1) B is of a paramagnetic material
(2) C is of a diamagnetic material
(3) D is of a ferromagnetic material
(4) A is of a non-magnetic material

AIPMT (Mains) 2011

21. A square loop, carrying a steady current I, is placed in a horizontal plane near a long straight conductor carrying a steady current I_1 at a distance d from the conductor as shown in figure. The loop will experience:-



(1) A net attractive force towards the conductor
(2) A net repulsive force away from the conductor
(3) A net torque acting upward perpendicular to the horizontal plane
(4) A net torque acting downward normal to the horizontal plane

AIPMT (Pre) 2012

22. An alternating electric field, of frequency ν, is applied across the dees (radius = R) of a cyclotron that is being used to accelerate protons (mass = m). The operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by:-

(1) $B = \frac{2\pi m\nu}{e}$ and $K = 2m\pi^2\nu^2R^2$

(2) $B = \frac{m\nu}{e}$ and $K = m^2\pi\nu R^2$

(3) $B = \frac{m\nu}{e}$ and $K = 2m\pi^2\nu^2R^2$

(4) $B = \frac{2\pi m\nu}{e}$ and $K = m^2\pi\nu R^2$

AIPMT (Mains) 2012

23. A proton carrying 1 MeV kinetic energy is moving in a circular path of radius R in uniform magnetic field. What should be the energy of an α-particle to describe a circle of same radius in the same field?
(1) 0.5 MeV (2) 4 MeV
(3) 2 MeV (4) 1 MeV

NEET-UG 2013

24. A current loop in a magnetic field :-
(1) Can be in equilibrium in two orientations, one stable while the other is unstable.
(2) Experiences a torque whether the field is uniform or non uniform in all orientations
(3) Can be in equilibrium in one orientation
(4) Can be in equilibrium in two orientations, both the equilibrium states are unstable

25. When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ towards west. The electric and magnetic fields in the room are :-

(1) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down

(2) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up

(3) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down

(4) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

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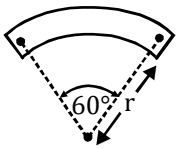
26. A bar magnet of length 'ℓ' and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be :-



(1) $\frac{M}{2}$ (2) M (3) $\frac{3}{\pi}M$ (4) $\frac{2}{\pi}M$

AIPMT 2014

27. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry I_1 and I_2 currents respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :-

(1) $\frac{\mu_0}{2\pi d}\left(I_1/I_2\right)$ (2) $\frac{\mu_0}{2\pi d}(I_1+I_2)$

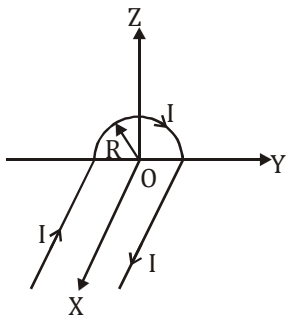
(3) $\frac{\mu_0}{2\pi d}(I_1^2-I_2^2)$ (4) $\frac{\mu_0}{2\pi d}(I_1^2+I_2^2)^{1/2}$

AIPMT 2015

28. An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude :

(1) Zero (2) $\frac{\mu_0 n^2 e}{r}$ (3) $\frac{\mu_0 ne}{2r}$ (4) $\frac{\mu_0 ne}{2\pi r}$

29. A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semi-circular portion of radius R is lying in Y-Z plane. Magnetic field at point O is :



(1) $\vec{B}=-\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}-2\hat{k}\right)$

(2) $\vec{B}=-\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}+2\hat{k}\right)$

(3) $\vec{B}=\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}-2\hat{k}\right)$

(4) $\vec{B}=\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}+2\hat{k}\right)$

Re-AIPMT 2015

30. A rectangular coil of length 0.12m and width 0.1m having 50 turns of wire is suspended vertically in a uniform magnetic field of strength 0.2 Weber/m^2. The coil carries a current of 2A. If the plane of the coil is inclined at an angle of 30° with the direction of the field, the torque required to keep the coil in stable equilibrium will be :

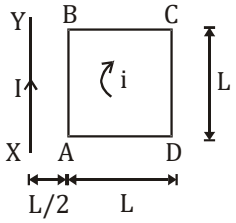
(1) 0.12 Nm (2) 0.15 Nm
(3) 0.20 Nm (4) 0.24 Nm

31. A proton and an alpha particle both enter a region of uniform magnetic field, B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particle will be :-

(1) 1 MeV (2) 4 MeV
(3) 0.5 MeV (4) 1.5 MeV

NEET-I 2016

32. A square loop ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I, the net force on the loop will be :-



(1) $\frac{2\mu_0 Ii}{3\pi}$ (2) $\frac{\mu_0 Ii}{2\pi}$

(3) $\frac{2\mu_0 IiL}{3\pi}$ (4) $\frac{\mu_0 IiL}{2\pi}$

TG: @Chalnaayaar

33. The magnetic susceptibility is negative for :
(1) diamagnetic material only
(2) paramagnetic material only
(3) ferromagnetic material only
(4) paramagnetic and ferromagnetic materials

34. A long straight wire of radius a carry a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances $\frac{a}{2}$ and 2a respectively, from the axis of the wire is :
(1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) 1 (4) 4

NEET-II 2016

35. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be :-
(1) 2nB (2) $2n^2B$
(3) nB (4) n^2B

36. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is :-
(1) $\frac{\sqrt{3}W}{2}$ (2) $\frac{2W}{\sqrt{3}}$
(3) $\frac{W}{\sqrt{3}}$ (4) $\sqrt{3}$ W

37. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is :-
(1) 62.8 MHz (2) 6.28 MHz
(3) 1 GHz (4) 100 MHz

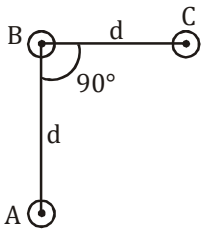
TG: @Chalnaayaaar

NEET(UG) 2017

38. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by :-
(1) $\tan^2\theta = \tan^2\theta_1 + \tan^2\theta_2$
(2) $\cot^2\theta = \cot^2\theta_1 - \cot^2\theta_2$
(3) $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$
(4) $\cot^2\theta = \cot^2\theta_1 + \cot^2\theta_2$

39. A 250 turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is:-
(1) 4.55 μJ (2) 2.3 μJ
(3) 1.15 μ J (4) 9.1 μ J

40. An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I along the same direction is shown in fig. Magnitude of force per unit length on the middle wire 'B' is given by :-



(1) $\frac{2\mu_0 i^2}{\pi d}$ (2) $\frac{\sqrt{2}\mu_0 i^2}{\pi d}$
(3) $\frac{\mu_0 i^2}{\sqrt{2}\pi d}$ (4) $\frac{\mu_0 i^2}{2\pi d}$

NEET(UG) 2018

41. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from
(1) the current source
(2) the magnetic field
(3) the lattice structure of the material of the rod
(4) the induced electric field due to the changing magnetic field

TG: @Chalnaayaaar

NEET(UG) 2019

42. At a point A on the earth's surface the angle of dip, $\delta = +25°$. At a point B on the earth's surface the angle of dip, $\delta = -25°$. We can interpret that:

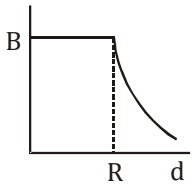
(1) A and B are both located in the northern hemisphere.

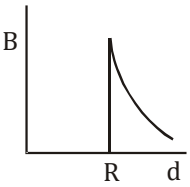
(2) A is located in the southern hemisphere and B is located in the northern hemisphere.

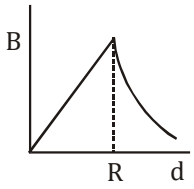
(3) A is located in the northern hemisphere and B is located in the southern hemisphere.

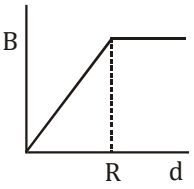
(4) A and B are both located in the southern hemisphere

43. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance d, from the centre of the conductor, is **correctly** represented by the figure :

(1) 

(2) 

(3) 

(4) 

44. Ionized hydrogen atoms and α-particles with same momenta enters perpendicular to a constant magnetic field B. The ratio of their radii of their paths $r_H : r_\alpha$ will be

(1) 2 :1 (2) 1 : 2

(3) 4 : 1 (4) 1 : 4

NEET(UG) 2019 (Odisha)

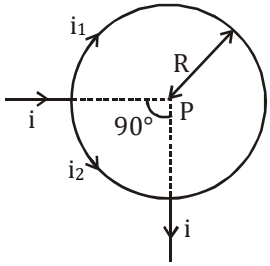
45. Two toroids 1 and 2 have total number of turns 200 and 100 respectively with average radii 40 cm and 20 cm respectively. If they carry same current i, then the ratio of the magnetic fields along the two is :

(1) 1 : 1 (2) 4 : 1

(3) 2 : 1 (4) 1 : 2

TG: @Chalnaayaaar

46. A straight conductor carrying current i splits into two parts as shown in the figure. The radius of the circular loop is R. The total magnetic field at the centre P of the loop is :



(1) Zero

(2) $3\mu_0 i/32$ R, outward

(3) $3\mu_0 i/32R$, inward

(4) $\mu_0 i/2R$, inward

NEET(UG) 2020

47. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) $2.4\pi \times 10^{-7}$ T m A^{-1}

(2) $2.4\pi \times 10^{-4}$ T m A^{-1}

(3) 8.0×10^{-5} T m A^{-1}

(4) $2.4\pi \times 10^{-5}$ T m A^{-1}

48. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 3.14×10^{-5} T (2) 6.28×10^{-4} T

(3) 3.14×10^{-4} T (4) 6.28×10^{-5} T

NEET(UG) 2020 (COVID-19)

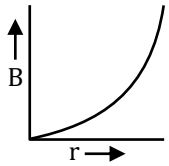
49. A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnetic moment is,

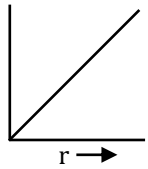
(1) $IL^2/4$ A m^2 (2) $I\pi L^2/4$ A m^2

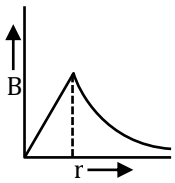
(3) $2IL^2/\pi$ A m^2 (4) $IL^2/4\pi$ A m^2

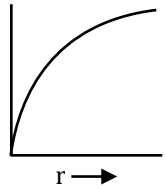
NEET(UG) 2021

50. A thick current carrying cable of radius 'R' carries current 'I' uniformly distributed across its cross-section. The variation of magnetic field B(r) due to the cable with the distance 'r' from the axis of the cable is represented by :

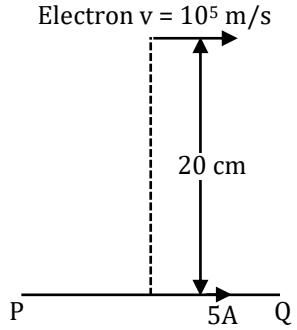
(1) 

(2) 

(3) 

(4) 

51. An infinitely long straight conductor carries a current of 5 A as shown. An electron is moving with a speed of 10^5 m/s parallel to the conductor. The perpendicular distance between the electron and the conductor is 20 cm at an instant. Calculate the magnitude of the force experienced by the electron at that instant.



(1) 4×10^{-20} N (2) $8\pi \times 10^{-20}$ N
(3) $4\pi \times 10^{-20}$ N (4) 8×10^{-20} N

52. In the product

$\vec{F} = q\left(\vec{v} \times \vec{B}\right) = q\vec{v} \times \left(B\hat{i} + B\hat{j} + B_0\hat{k}\right)$

For q = 1 and $\vec{v} = 2\hat{i} + 4\hat{j} + 6\hat{k}$

and $\vec{F} = 4\hat{i} - 20\hat{j} + 12\hat{k}$

What will be the complete expression for $\vec{B}$?

(1) $-8\hat{i} - 8\hat{j} - 6\hat{k}$ (2) $-6\hat{i} - 6\hat{j} - 8\hat{k}$
(3) $8\hat{i} + 8\hat{j} - 6\hat{k}$ (4) $6\hat{i} + 6\hat{j} - 8\hat{k}$

53. A uniform conducting wire of length 12a and resistance 'R' is wound up as a current carrying coil in the shape of,
(i) an equilateral triangle of side 'a'.
(ii) a square of side 'a'.
The magnetic dipole moments of the coil in each case respectively are:

(1) $\sqrt{3}\,Ia^2$ and $3\,Ia^2$ (2) $3\,Ia^2$ and Ia^2
(3) $3\,Ia^2$ and $4\,Ia^2$ (4) $4\,Ia^2$ and $3\,Ia^2$

TG: @Chalnaayaaar

NEET(UG) 2022

54. Given below are two statements:
Statement I :
Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.
Statement II :
Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.
In light of above statement choose the most appropriate answer from the options given below:

(1) Both statement I and Statement II are incorrect
(2) Statement I is correct and Statement II is incorrect
(3) Statement I is incorrect and Statement II is correct
(4) Both statement I and Statement II are correct

55. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:

(1) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.
(2) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with 1/r dependence for the outside region.
(3) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.
(4) uniform and remains constant for both the regions.

TG: @Chalnaayaaar

RE-NEET (UG) 2022

56. A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space = $4\pi \times 10^{-7}$ H/m) nearly:

(1) 10^{-1} T (2) 10^{-2} T

(3) 10^{2} T (4) 10^{-3} T

57. The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is :

(1) a straight line (2) circular

(3) elliptical (4) a plane

58. Two very long, straight, parallel conductors A and B carry current of 5A and 10A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is:
($\mu_0 = 4\pi \times 10^{-7}$ SI unit)

(1) 2×10^{-4} Nm^{-1} and is attractive

(2) 2×10^{-4} Nm^{-1} and is repulsive

(3) 1×10^{-4} Nm^{-1} and is attractive

(4) 1×10^{-4} Nm^{-1} and is repulsive

59. The magnetic field on the axis of a circular loop of radius 100 cm carrying current $I = \sqrt{2}$ A, at point 1 m away from the centre of the loop is given by:

(1) 3.14×10^{-7} T (2) 6.28×10^{-7} T

(3) 3.14×10^{-4} T (4) 6.28×10^{-4} T

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	4	2	3	3	2	1	4	2	3	1	4	2	2	4
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	1	3	2	2	1	1	1	4	1	3	3	4	3	2	3
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	1	1	1	3	4	4	3	4	4	3	1	3	3	1	1
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	
Answer	1	2	2	4	3	4	2	1	2	2	4	2	3	1	

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Exercise – III (Analytical Questions) Master Your Understanding

1. Two circular coils of radii 5 cm and 10 cm carry currents of 2 A. The coils have 50 and 100 turns respectively and are placed in such a way that their planes as well as their centres coincide. Magnitude of magnetic field at the common centre of coils is

(a) $8\pi \times 10^{-4}$ T if currents in the coils are in same sense

(b) $4\pi \times 10^{-4}$ T if currents in the coils are in opposite sense

(c) zero if currents in the coils are in opposite sense

(d) $8\pi \times 10^{-4}$ T if currents in the coils are in opposite sense

(1) b and d are correct (2) a and c are correct

(3) only a are correct (4) only d are correct

2. When a current carrying coil is placed in a uniform magnetic field with its magnetic moment anti-parallel to the field

(a) Torque on it is maximum

(b) Torque on it is zero

(c) Potential energy is maximum

(d) Dipole is in unstable equilibrium

(1) b, c, d are correct (2) only b is correct

(3) a and c are correct (4) none

3. If a long cylindrical conductor carries a steady current parallel to its length

(a) the electric field along the axis is zero

(b) the magnetic field along the axis is zero

(c) the magnetic field outside the conductor is zero

(d) the electric field outside the conductor is zero

(1) b and d are correct (2) a and c are correct

(3) only d is correct (4) none

4. A charged particle revolves in circular path in uniform transverse magnetic field after being accelerated by a potential difference of V volt. If V is doubled, then choose the correct options.

(a) Kinetic energy of particle will become two times

(b) Radius of circular path will become two times

(c) Radius of circular path will become $\sqrt{2}$ times

(d) angular velocity will remain unchanged

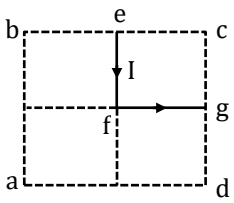
(1) a and b are correct

(2) a and c are correct

(3) a, c, d are correct

(4) none

5. abcd is a square. There is a current I in wire efg as shown. Choose the correct options :



(a) Net magnetic field at a is inwards

(b) Net magnetic field at f is zero

(c) Net magnetic field at c is zero

(d) Net magnetic field at g is zero

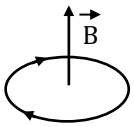
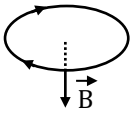
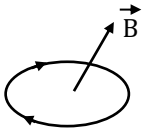
(1) a and b are correct

(2) a, b, c are correct

(3) b and c are correct

(4) none

6. In column I, a current carrying loop and a uniform magnetic field are shown. Match this with column II.

	Column-I		Column-II
(a)		(p)	$F \neq 0$
(b)		(q)	Maximum torque
(c)		(r)	Minimum potential energy
(d)		(s)	Positive potential energy

(1) a-s, b-p, c-r, d-q (2) a-s, b-q, c-r, d-s

(3) a-s, b-r, c-p, d-q (4) a-q, b-p, c-r, d-s

TG: @Chalnaayaaar

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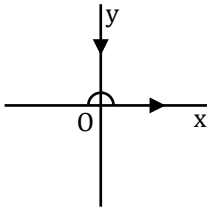
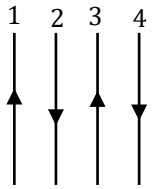
7. Equal currents are flowing in two infinitely long separate wires lying along x and y-axes in the directions shown in figure. Match the following two columns.



	Column-I		Column-II
(a)	Magnetic field at (a, a)	(p)	along positive y-axis
(b)	Magnetic field at (–a. – a)	(q)	along positive z-axis
(c)	Magnetic field at (a, –a)	(r)	along negative z-axis
(d)	Magnetic field at (–a, a)	(s)	zero

(1) a-p, b-q, c-s, d-r (2) a-q, b-r, c-s, d-s
(3) a-r, b-s, c-p, d-r (4) a-s, b-p, c-q, d-s

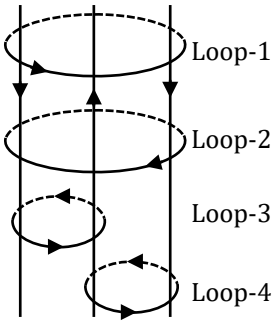
8. Equal currents are flowing in four infinitely long wires. Distance between two wires is same and directions of currents are shown in figure. Match the following two columns.



	Column-I		Column-II
(a)	Force on wire-1	(p)	Inwards
(b)	Force on wire-2	(q)	Leftwards
(c)	Force on wire-3	(r)	Rightwards
(d)	Force on wire-4	(s)	Zero

(1) a-q, b-r, c-q, d-r (2) a-r, b-q, c-p, d-r
(3) a-q, b-p, c-q, d-p (4) a-p, b-r, c-p, d-r

9. Three wires are carrying same constant current i in different directions. Four loops enclosing the wires in different manners are shown in figure. The direction of $d\vec{\ell}$ is shown in the figure.

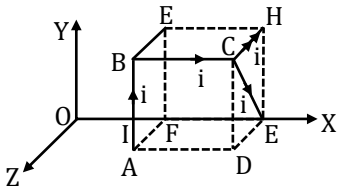


	Column-I		Column-II
a	Along close Loop-1	p	$\oint \vec{B}\cdot d\vec{\ell} = \mu_0 i$
b	Along close Loop-2	q	$\oint \vec{B}\cdot d\vec{\ell} = -\mu_0 i$
c	Along close Loop-3	r	$\oint \vec{B}\cdot d\vec{\ell} = 0$
d	Along close Loop-4	s	$\oint \vec{B}\cdot d\vec{\ell} = 2\mu_0 i$

(1) a – q, b – p, c – r, d – r
(2) a – p, b – r, c – s, d – s
(3) a – r, b – p, c – s, d – p
(4) a – r, b – q, c – q, d – q

10. Side of cube is 'a' and wire AB, BC, CH and CE are insulated with each other. If each having current i, then match the following. External magnetic field applied along positive x-axis as $\vec{B} = B_0\hat{i}$

given that OF = a



	List-I (Magnitude of force due to external magnetic field only)		List-II
(a)	On AB	(p)	Zero
(b)	On BC	(q)	$\sqrt{2}iB_0a$
(c)	On CH	(r)	iB_0a
(d)	On CE	(s)	$2iB_0a$

(1) a – r, b – p, c – r, d – q
(2) a – p, b – p, c – s, d – q
(3) a – q, b – s, c – r, d – s
(4) a – s, b – r, c – d, d – q

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11. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : An electron cannot be accelerated by cyclotron.

Reason (R) : Mass of electron is too small.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

12. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Force on a current carrying wire of length $\overrightarrow{d\ell}$ placed in magnetic field $\vec{B}$ is given by $\overrightarrow{dF} = i\overrightarrow{d\ell} \times \vec{B}$

Reason (R) : Net force on a current carrying loop in a non-uniform magnetic field must be non-zero.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

13. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The ferromagnetic substances obey Curie's law.

Reason (R) : At Curie point ferromagnetic substances start behaving as paramagnetic substances.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

14. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The surface integral of magnetic field over any closed surface is always zero.

Reason (R) : Magnetic poles always exists in pair.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

15. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : A moving charge produces magnetic field.

Reason (B) : A current element produces magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

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16. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Parallel wires carrying currents in same direction attracts each other due to magnetic force.

Reason (R) : Two electron beams moving parallel to each other repel each other due to electric force.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

17. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Ampere's circuital law is not suitable for a finite straight wire carrying current I.

Reason (R) : One cannot calculate magnetic field due to a finite straight current carrying wire by using Biot Savart Law.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

18. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The angle of dip at geomagnetic pole is zero

Reason (R) : In general, in a vertical plane perpendicular to the magnetic meridian the dip needle becomes exactly vertical

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

19. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The diamagnetic substances do not obey Curie's law.

Reason (R) : At Curie point ferromagnetic substances start behaving as paramagnetic substances.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

20. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Solenoid is used to generate magnetic field in television.

Reason (R) : Value of orbital magnetic moment, for first orbit of a single electron species is 0.927×10^{-23} A-m^2.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

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21. **Statement–1** : In an isolated conductor, free electrons keep on moving but no net magnetic force acts on a conductor in a magnetic field.
Statement–2 : In a conductor, the average velocity of thermal motion of electrons is zero. Hence no current flows through the conductor.
(1) Statement–1 is True, Statement–2 is True ; Statement–2 is a correct explanation for Statement–1.
(2) Statement–1 is True, Statement–2 is True ; Statement–2 is not a correct explanation for Statement–1.
(3) Statement–1 is True, Statement–2 is False.
(4) Statement–1 is False, Statement–2 is True.

22. A particle with charge Q is moving in fields of combination given below. Match for the most correct possible path/s. Then match the following :-

	Column-I		Column-II
(A)	Uniform $\vec{E}$	(P)	Straight line
(B)	Uniform $\vec{B}$	(Q)	Parabola
		(R)	Circular

Options :-
(1) A → PQ, B → PR
(2) A → P, B → R
(3) A → Q, B → PR
(4) A → P, B → PQ

23. **Match the column I with column II -**

	Column-I		Column-II
(A)	Paramagnetic substance	(P)	$\chi_m = -1$
(B)	Diamagnetic substance	(Q)	$\chi_m < 0$
(C)	Super conductor	(R)	$\chi_m >> 1$
(D)	Ferromagnetic substance	(S)	$\mu_r > 1$

Options :-
(1) A → S, B → Q, C → P, D → R
(2) A → R, B → P, C → Q, D → S
(3) A → S, B → P, C → Q, D → R
(4) A → R, B → Q, C → P, D → S

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	1	1	3	1	2	2	1	1	1	1	3	4	1	2
Question	16	17	18	19	20	21	22	23							
Answer	2	3	4	2	2	1	1	1							

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